MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2018/2019

DET5058 – DIGITAL ELECTRONICS

(Diploma in Electronic Engineering)

9 MARCH 2019
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **5** pages excluding cover page with **4** Questions only.
2. Answer **ALL** questions. All necessary working steps must be shown.
3. Write all your answers in the answer booklet provided.

QUESTION 1 [25 Marks]

a) Provide any **FOUR** analog quantities that are normally converted into digital signals.

[4 marks]

b) Name **FOUR** major components of a computer system.

[4 marks]

c) One of the advantage of digital systems over analog systems is "digital systems are less affected by noise". Explain why.

[2 marks]

d) Convert the BCD number 00110111100001100001 into:

(i) Decimal
(ii) Binary
(iii) Octal
(iv) Hexadecimal
(v) Gray

[10 marks]

e) Given 10001111_2 and 11110011_2 are both in 2's complement form.

(i) Add the numbers in 8-bit 2's complement form.

[2 marks]

(ii) State whether overflow occurs or not. Support your statement through redoing the addition in decimal and evaluating the addition result.

[3 marks]

Continued...

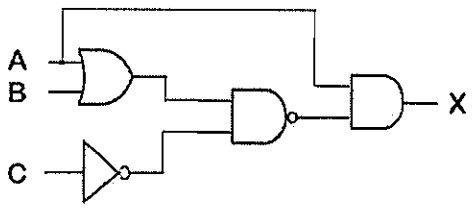
QUESTION 2 [40 Marks]

a) Sketch the logic gates symbol and provide the truth table for a 2-input Exclusive-OR gate.

[4 marks]

b) Show the Boolean expression for the output X for each circuit in Figure Q2(b).

(i)



(ii)

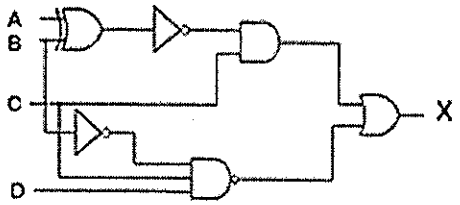


Figure Q2(b)

[4 marks]

c) Apply the given values for A, B, C, D and complete the truth table in Table Q2(c) below.

A	B	C	D	$\overline{\overline{AD(C+A)+B}}$
1	0	1	1	

Table Q2(c)

[2 marks]

d) For the Boolean Expression: $X = A\overline{C}(B+C) + \overline{B}\,\overline{AC} + A\overline{B}$.

(i) Construct the logic circuit diagram.

[5 marks]

(ii) Simplify the Boolean expression using Boolean simplification.

[5 marks]

Continued...

e) Derive the Boolean expression for the circuit in Figure Q2(e).

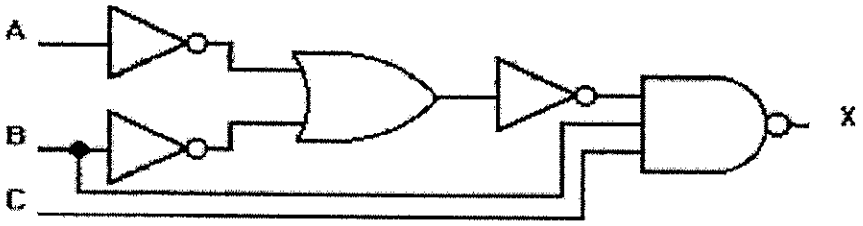


Figure Q2(e)

[3 marks]

f) Develop the truth table for the logic circuit in Figure Q2(e).

[5 marks]

g) Apply the given values for *A, B, C, D* and complete the truth table in Table Q2(g) below for the given expression: $X = \overline{AB} + (\overline{DB \oplus A})$.

A	B	C	D	$\overline{DB \oplus A}$	X
1	1	1	1		

Table Q2(g)

[4 marks]

h) Use Karnaugh Map method to find the minimum product of sum for:

$f(A,B,C,D) = \Pi M(1,8,10) \cdot D(0,2,5,12,13,14,15)$.

[8 marks]

Continued...

QUESTION 3 [20 Marks]

a) Given a Half-Adder where its inputs are A and B, and its outputs are Carry (C) and Sum (Σ). Answer the following:

(i) Sketch the truth table of a Half-Adder.

[4 marks]

(ii) Show the logic expressions for Carry (C) and Sum (Σ).

[2 marks]

(iii) Illustrate the logic circuit diagram.

[2 marks]

b) Define multiplexer.

[2 marks]

c) Draw the diagram of a decimal-to-binary encoder.

[3 marks]

d) Construct the 4 bit parallel adder using 1-bit full adder that show $0011+1101=0000$, assume $C_4=1$.

[7 marks]

Continued...

QUESTION 4 [15 Marks]

a) Show any **three** types of latches.

[3 marks]

b) Present **one** similarity and **three** differences between Latch and Flip-Flops.

[4 marks]

c) Use positive edge triggered J-K flip flop to complete the truth table (operation) in Table Q4(c) and output waveforms in Figure Q4(c). Assume the flip-flop is initially RESET.

INPUTS		OUTPUTS	
J	K	Q_N	$\overline{Q_N}$
0	0	NC	NC
0	1	i.	ii.
1	0	iii.	0
1	1	iv.	Q_{N+1}

Table Q4(c)

[4 marks]

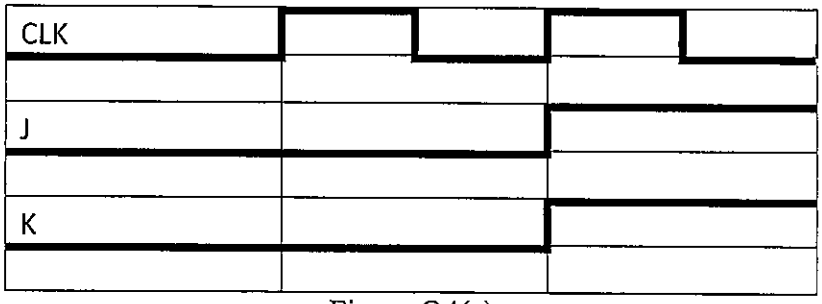


Figure Q4(c)

[4 marks]

End of Page.

APPENDIX: RULES OF BOOLEAN ALGEBRA

1. $A + 0 = A$
2. $A + 1 = 1$
3. $A \cdot 0 = 0$
4. $A \cdot 1 = A$
5. $A + A = A$
6. $A + \overline{A} = 1$
7. $A \cdot A = A$
8. $A \cdot \overline{A} = 0$
9. $\overline{\overline{A}} = A$
10. $A + AB = A$
11. $A + \overline{A}B = A + B$
12. $(A + B)(A + C) = A + BC$